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COMPOSITION OF BELT LUBRICANT

BACKGROUND OF THE INVENTION

Field of Invention

10 [0001] The present invention relates to a composition of a lubricant. More particularly, the present invention relates to a composition of a belt lubricant or a chain sliding agent.

Description of Related Art

15 [0002] In the bottling or filling, respectively, of foodstuff, the vessels have to be moved by means of special conveyor belts, especially, bottle conveyor belts. Usually, such conveyor belts is comprised of special steel, rarely plastic. In order to facilitate the movement of the vessels, i. e. bottles or other vessels made of glass or plastic, the belts have to be lubricated by a sliding agent (so-called belt lubricants or chain sliding agents).

20 [0003] There are known belt lubricants having different compositions. For example, belt lubricants on basis of soaps (salts of fatty acids), on basis of carboxylated polyglycol ethers (ether carboxylic acids), on basis of amines (with primary, secondary, tertiary amines and combination thereof, wherein the amines can also be present in form of salts) are known. Further, belt lubricants on basis of diamines, especially
25 dipropionamines, and on basis of phosphated alkanolethoxylates are also known.

 [0004] The application of numerous of the aforementioned active components is disclosed, e. g., in the following patent documents, so among others: EP-A- 0 044 458 (carboxylated polyglycol ethers; acylsarcosinate), DE-A- 38 31 448 (phosphated

5 alkanolethoxylates), DE-A- 23 13 330 (soaps), DE-A- 36 31 953 [US 4,839,067] (fatty
amine salts), EP-A- 0384 282 (secondary and/or tertiary amines), US 5,062,978
(alkyldiamine salts), WO 92/13050 (diamineacetate, nonionic surfactants), DE-A- 42 44
536 (alkyldiamines and salts thereof, ether carboxylic acids), WO 95/19412
(alkyldiamines, also cyclic, and salts thereof), EP-0372 628 B1 (diamines and several
10 fatty alkyl monoamine derivates, especially carboxylates), JP-A-74/010794; JP-A-
89/096294; US-A-4521321; US-A-4504720; ZA-A-77/7258; ZA-A-83/7963 and AU-
A-10004/83 (several amines), EP-0 652 927 B1 (\cong WO 94/03562) (ether amines having
at least 3 N-atoms), EP-372 628 B1 (fatty alkyl amines).

[0005] In EP 0 652 927 B1, lubricant concentrates and aqueous lubricant solutions
15 on basis of fatty amines are described. The fatty amines mentioned therein are ether
amines and comprise at least three nitrogen atoms, and thus, belong to the group of
trialamines. EP 372 628 B1 describes the use of belt lubricant concentrates comprising up
to 30 wt.-% of fatty amines.

[0006] Diverse belt lubricants can be formulated by the aforementioned active
20 substances, alone or in combination together, and optionally with addition of auxiliaries
and additives such as solvents, chelating agents, threshold-active substances, hydrotropes,
urea, biocides, specific organic acids and other.

[0007] Several problems, which are not solved until now or only partly solved, can
arise by application of the known belt lubricants. For example, a precipitation leading to
25 an obstruction of the spray nozzles and a decrease of the performance can be caused by a
too high sensitivity to several ions in the non-drinkable water for industrial purposes such
as carbonate, hydrogencarbonate, sulfate or earth alkali ions. Further, a disturbing dirt
collects by an insufficient purifying effect on the belt conveyor, and especially between

5 the individual chain links, of which it consists. Moreover, the belt conveyor can be affected by microorganisms by an insufficient biocide effect, while a too strong biocide effect can lead to problems in the function of sewage plants. The bottle check is disturbed at the light barriers in case of a too strong foam development. Further, a strong sensitivity to residues of the liquid to be filled or bottled, respectively, such as beer, milk, fruit juices,
10 mineral water on the belt conveyor effects a rapid decrease of the lubricating effect of the aforementioned belt lubricants. Additionally, the lubricating effect often occurs with time lag at the beginning of the production.

[0008] The belt lubricants known today are offered from the manufacturers to the consumer as aqueous diluted solutions. Mostly, they comprise 2-15 wt.-% of main active
15 component, mostly alkylamines and derivatives thereof, further different amounts of further auxiliaries or additives (surfactants, solvents, chelating agents, acids etc.), respectively. Then, these aqueous solvents are further diluted upon application directly on the installation. The concentration of the main active component on the conveying belt is about 50-300 ppm.

20 [0009] However, it would be a great economic advantage, if one could use water-free or nearly water-free belt lubricant concentrates comprising substantially higher amounts of active components. Thereby, one could realize substantial cost savings (production, packaging and freight costs).

[0010] Belt lubricants concentrates having a high amount of fatty alkyl amines are
25 already mentioned in EP 372 628 B1. Therein, ether amines of the general formula:



5 are mentioned, wherein

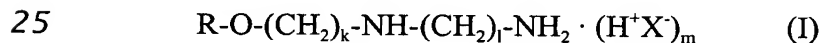
R_1 is a saturated or unsaturated, branched or linear alkyl group having 8 to 22 C atoms; R_2 is hydrogen, an alkyl or hydroxyalkyl group having 1 to 4 C atoms or $-A-NH_2$; A represents a linear or branched alkylene group having 1 to 8 C atoms.

[0011] But, according to EP 372 628 B1 it is essential that the fatty amines of the
10 aforementioned formula are only comprised up to 30 wt.-% in the belt lubricants concentrates. Namely, hitherto it was not possible in a technical way to produce belt lubricants concentrates comprising more than 30 wt.-% of fatty amines of the general formula given above.

15 **Summary of the Invention**

[0012] Therefore, it is an object of the present invention to provide belt lubricant or chain sliding agent concentrates having a novel active component, whereby water-free belt lubricant concentrates having substantially higher amounts of active components can be obtained.

20 [0013] This object is achieved by the belt lubricant concentrates on basis of ether diamines or salts thereof, (A) and/or on basis of N-alkyldipropionamines or salts thereof (B), and optionally usual diluents and/or auxiliaries or additives, respectively, characterized in that they comprise as at least one active component of one or more ether diamines of the following general formula (I) or salts thereof (A):



wherein R is a substituted or unsubstituted, linear or branched, saturated or mono- or polyunsaturated alkyl residue having 6 to 22 carbon atoms, wherein the substituents are selected from amino, imino, hydroxy, halogen and/or carboxy residues, or an substituted

5 or unsubstituted phenyl residue, wherein the substituents are selected from amino, imino, hydroxy, halogen, carboxy residues and a linear or branched, saturated or mono- or polyunsaturated alkyl residue having 6 to 22 carbon atoms. X^- represents an anion of an inorganic or organic acid; k , l are each independently from each other an integer in the range of 1 to 6; m is an integer of 0 to 2. The lubricant concentrates comprise 0.1 to 100
 10 wt.-% of ether amines of formula (I) or salts thereof (A), especially 97 wt.-% of ether amines of formula (I) or salts thereof (A), and 99.9 to 0 wt.-%, especially 3 wt.-%, of water and/or auxiliaries or additives, each basing on the formulation as a whole, and/or one or more N-alkyldipropiondiamines of the following formula (II) or salts thereof (B):



15 wherein R_1 is a saturated or unsaturated, branched or linear alkyl group having 8 to 22 carbon atoms; R_2 is hydrogen, an alkyl group or an hydroxyalkyl group having 1 to 4 carbon atoms or $-A-NH_2$, and A is a linear or branched alkylene group having 1 to 8 carbon atoms, wherein the lubricant concentrates comprise N-alkyldipropionamines of formula (II) or salts thereof (B) in amounts of from more than 30 wt.-% and up to 100
 20 wt.-%, each based on the formulation as a whole, and optionally water and/or auxiliaries or additives, respectively, adding up to 100 wt.-% of the concentrates.

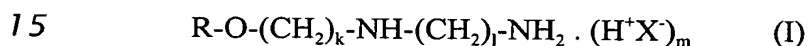
[0014] The belt concentrates of the invention also comprises other active components or auxiliaries and/or additives such as anion of any inorganic or organic acid, for example, 0.1 to 99 wt.-% of a fatty acid ester. Additives or auxiliaries for influencing
 25 the storage stability and the viscosity of the belt lubricant may be included. Auxiliaries or additives, such as, threshold-active substances, biocides, buffers for pH-regulation, formaldehyde cleaving agents and/or chelating agents may also be used in combination with the aforementioned ether amines and/or N-alkyldipropionates (B).

5 **[0015]** It is to be understood that both the foregoing general description and the following detailed description are exemplary, and are intended to provide further explanation of the invention as claimed.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

10 **[0016]** The invention relates to belt lubricant or chain sliding agent concentrates on basis of ether diamines or salts thereof (A) and/or on basis of N-alkyl dipropionates (B).

[0017] According to the invention, ether diamines having the general formula (I) below or salts thereof are suitable for sliding agents and solve at least the aforementioned problems in an optimum way:



 wherein R is a substituted or unsubstituted, linear or branched, saturated or mono- or polysaturated alkyl residue having 6 to 22 carbon atoms, wherein the substituents are selected from amino, imino, hydroxy, halogen and/or carboxy residues, or a substituted or unsubstituted phenyl residue, wherein the substituents are selected from amino, imino, hydroxy, halogen, carboxy residues and a linear or branched, saturated or mono- or polyunsaturated alkyl residue having 6 to 22 carbon atoms; X- represents an anion of an inorganic or organic acid; k, l are each independently from each other an integer in the range of 1 to 6; m is an integer of 0 to 2, wherein the lubricant concentrate comprises 0.1 to 100 wt.-% of ether amines of formula (I) and 99.9 to 0 wt.-% of water and/or auxiliaries or additives, respectively, each basing on the formulation as a whole.

[0018] The aforementioned ether amines having the general formula (I) or salts thereof can be used alone or in combination with other active components or auxiliaries and/or additives, respectively.

5 **[0019]** The amount of the aforementioned ether diamines or salts thereof can be between 0.1 and 100 wt.-% in the formulation as a whole.

[0020] X- can represent an anion of any inorganic or organic acid. In the sense of the present invention, it is only important for the selection of this acid that the acid or the anion thereof does not lead to precipitations in combination with the ether amines of
10 general formula (I) according to the invention, and thereby affects the water solubility of the inventive lubricant. Additionally, such acids which form salts, which are liquid at room temperature and in water-free formulations, or which can be liquefied by addition of relatively small amount of organic solvent are preferred, since only this acid allows the formulation of highly concentrated, water-free or nearly water-free lubricant concentrates.
15 Additionally, it is advantageous if acid amounts being leaner than stoichiometric act as solvent for the salt formed.

[0021] Especially, also anionic surfactants such as carboxylated polyglycol ethers or phosphoric acid esters of fatty alcohol ethoxylates can be used as acid. These surfactants can perform several functions in the formulations : formation of water soluble
20 ether amine salts, pH-regulation, emulsifying agent function, lubricating effect. Also, these acids can be combined with each other, e.g. mixtures of phosphate esters of fatty alcohol ethoxylates and acetic acid are preferred according to the invention.

[0022] Further known and preferred auxiliaries or additives are particularly: solvents such as alcohols (e.g., isopropanol, ethanol), glycols (e.g., 1,2-propyleneglycol),
25 fatty acid esters (e.g., 2-ethylhexylpalmitate; decyloleate; soya methyl ester) for improving the homogeneity or for controlling the dilution operation in the application.

[0023] If a biocide effect of the belt lubricant is desired, one can add commercially available biocides. It is possible to select the biocides according to the special customer

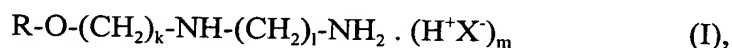
5 requirements, such as biocides being free from formaldehyde, biocides being free from halogenes etc. Several biocides can be used as additives, there are among them generally known active components such as 5-chloro-2-methyl-3-(2H)-isothiazolone, 2-methyl-3-(2H)-isothiazolone, 1,2-benzisothiazole-3(2H)-one, 2-octyl-3-(2H)-isothiazolone, 3-iodo-2-propinylbutylcarbamate, 2-pyridinethiol-1-oxide, Na-salt, 1,2-dibromo-2,4-
10 dicyanobutane, 2-bromo-2-nitro-1,3-propanediol.

[0024] Also, further substances such as formaldehyde cleaving agents can be still added: dimethylol urea, [1,2-ethanediylbis(oxy)]-bis-methanol, 3,3'-methylene-bis-5-methyl-oxazolidine, 1,3,5-triazine-1,3,5(2H,4H,6H)-triethanol.

[0025] Phosphonates can be used as threshold-active components to stabilize to
15 water hardener. Chelating agents such as NTA serve for stabilization to water hardener.

[0026] All commercially available emulsifying agents independent on their ionic character (anionic, non-ionogenic, amphoteric or cationic emulsifying agents, alone or in combination with each other) are suitable as emulsifying agents. Non-ionogenic emulsifying agents such as fatty alcohol or fatty acid ethyloxylates or the analogous
20 ethoxo-propoxylates (so-called "EP-PO-surfactans") are preferred. These emulsifying agents are usually relatively insensitive in relation to the water hardness and pH value. In case of a suitable selection, they are biological degradable and comprise neither nitrogen nor phosphorus.

[0027] The belt lubricant concentrates or chain sliding agent concentrates can
25 comprise the aforementioned ether diamines (A) of formula (I) and/or the N-alkyl dipropionates (B) of formula (II), alone or in combination, as active components.



5 wherein R is a substituted or unsubstituted, linear or branched, saturated or mono- or
 polyunsaturated alkyl residue having 6 to 22 carbon atoms, wherein the substituents are
 selected from amino, imino, hydroxy, halogen and/or carboxy residues, or an substituted
 or unsubstituted phenyl residue, wherein the substituents are selected from amino, imino,
 hydroxy, halogen, carboxy residues and a linear or branched, saturated or mono- or
 10 polyunsaturated alkyl residue having 6 to 22 carbon atoms. X⁻ represents an anion of an
 inorganic or organic acid; k, l are each independently from each other an integer in the
 range of 1 to 6; m is an integer of 0 to 2. The lubricant concentrate comprises 0.1 to 100
 wt.-% of ether amines of formula (I) and 99.9 to 0 wt.-% of water and/or auxiliaries or
 additives, respectively, each basing on the formulation as a whole,



wherein R₁ is a saturated or unsaturated, branched or linear alkyl group having 8 to 22
 carbon atoms; R₂ is hydrogen, an alkyl group or an hydroxyalkyl group having 1 to 4
 carbon atoms or -A-NH₂, and A is a linear or branched alkylene group having 1 to 8
 carbon atoms, wherein the lubricant concentrates comprise alkyldipropionamines of
 20 formula (II) in amounts of from more than 30 wt.-% and up to 100 wt.-%, each based on
 the formulation as a whole, and optionally water and/or auxiliaries or additives,
 respectively, adding up to 100 wt.-% of the concentrates.

[0028] However, a provision is that the amount of N-alkyldipropionamines of
 formula (II) in the formulation as a whole is more than 30 wt.-%, i.e. up to 100 wt.-%. All
 25 acids, which salts are water soluble with the concerned N-alkyldipropionamines and are
 either liquid itself at room temperature or can be liquefied easily by addition of small
 amounts of organic solvents are suitable acids for the salts of the N-alkyldipropionamines.
 Acetic acid is especially suitable. Especially, anionic surfactants such as ether carboxylic

5 acid or phosphoric acid esters of fatty alcohol ethoxylates can be used as acid. Known
N-alkyldipropiondiamines are, e.g., the commercial articles Duomeen® OX (company
AKZO) and Lonzabac® 12 (company Lonza, Switzerland).

[0029] The lubricant concentrates according to the invention are diluted to an
application concentration of 5 to 350 mg/kg of active component, preferably 5 to 300
10 mg/kg of active component, and especially preferred 10 to 100 mg/kg of active
component and are used in the foodstuff industry to lubricate, clean and disinfect
automatic chain and belt lubricating installations which are employed to fill or bottle
foodstuff, preferably beverages, into glass and plastic bottles, cans, paper containers,
cardboard containers and the like.

15 [0030] The invention is now further explained by the following examples, however
without being limited thereto.

[0031] Example 1: Water-free formulation

97 parts by weight of ether amine acetate $[R-O-(CH_2)_3-NH-(CH_2)_3-NH_2 \cdot (H^+CH_3-$
COO $^-)_2]$, wherein R = lauryl/cetyl residue (C12-C14, linear, saturated)

20 2 parts by weight of 2-ethylhexylpalmitate (organic solvent)

1 part by weight of lauryl alcohol-4EO-phosphate (mono and diester; anionic
emulsifying agent).

[0032] Example 2: Aqueous formulation

5 parts by weight of the above water-free formulation 1)

25 95 parts by weight of deionized water
(opalescent, but storage-stable liquid).

[0033] Dosage and results

5 Both formulations were used at a dosage corresponding to 100 ppm of ether amine on the belt conveyor.

Belt speed: 80,000 bottles/hour.

Bottles: glass beer bottles having a flat and a grooved bottom.

The sliding effect occurs virtually immediately (without time lag).

10 Friction coefficient: 0.10 (Friction coefficients $< 0,15$ are already also sufficient for high-speed belts).

Foam effect: optimum (no nil return at the light barrier).

[0034] It will be apparent to those skilled in the art that various modifications and variations can be made to the structure of the present invention without departing from
15 the scope or spirit of the invention. In view of the foregoing, it is intended that the present invention cover modifications and variations of this invention provided they fall within the scope of the following claims and their equivalents.